

Neural Style Transfer

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1. Style Transfer Configuration:

- Training platform: Google Colab
- Pretrained model used: VGG16
- Layers for the content: ['block4_conv2']
- Layers for the style:
['block1_conv1', 'block2_conv1', 'block3_conv1', 'block4_conv1']
- Content weight: $1e4$
- Style weight: 1
- Number of iterations: 500
- Optimizer: Adam - learning_rate=0.05, beta_1=0.99, epsilon= $1e-1$
- Total variation weight: 50
- The time needed to produce the generated image: 2454.1

2. Justification of Parameter Selection:

The pretrained model was changed from VGG19 to VGG16 to improve training speed. VGG16 has fewer convolutional layers, which makes forward and backward passes faster while still having a relatively good feature extraction for this exercise. Overall, VGG16 offers a good trade-off between training time and result quality.

The selected content layer in VGG16 is `block4_conv2`. This layer serves a similar role in capturing high-level content structure (e.g., shapes, object layouts).

The content weight was kept at $1e4$ to keep the strong emphasis on the content's structure and shapes. This helps the picture still have recognizable elements of the original content. The style weight was increased to amplify the influence of the style image in the final result. With the new model and new intermediate layers, the original setting ($1e-2$) was minimal and the output was too similar to the content image. Setting it to 1 has helped the result have more visible stylization.

Reducing the number of iterations was to shorten training time. With the original iterations (1000), it takes more than 2 hours to train for my chosen platform.

Changing the learning rate from 0.02 to 0.05 was to increase convergence speed, especially after reducing the number of iterations.

Total variation loss was changed from 30 to 50 to smooth out rough edges introduced by strong style gradients, especially important when using fewer iterations or a higher learning rate.



Figure 1: Content (left) and style (right) image.



Figure 2: Transferred image.